

Applicant: Niume, et al.

Serial No.: 09/889,395

Filed: July 17, 2001

April 24, 2003

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REMARKS

The Examiner has rejected Claims 2, 7, 16 and 20 under 35 U.S.C 112, second paragraph, as being indefinite. Applicants have amended the claims to further clarify the invention. Therefore, the rejection should be withdrawn.

The Examiner has rejected Claims 1-5, 10, 11, 14-19, 23 and 24 under 35 U.S.C. 102(b) as being anticipated by Kanbara, et al. Applicants respectfully disagree.

The present invention is distinguished from Kanbara because Kanbara teaches the use of a hydroxide dispersion while the present invention teaches and claims a coating solution containing stannic acid that is dissolved in an aqueous that is different than the Kanbara dispersion. The Examiner points out that Kanbara, et al. disclose a coating solution obtained from hydrolyzing tin chloride to form tin hydroxide solution. Aqueous ammonia and a water soluble polymer are then added to form a coating solution.

However, the coating solution in Kanbara, et al. is very different from the present transparent conductive tin oxide film. Kanbara, et al. teaches a coating comprising an indium hydroxide-tin hydroxide mixture prepared by coprecipitation from an aqueous solution of InCl_3 and SnCl_4 . The mixed hydroxide collected is dispersed in water with vigorous stirring. A water-soluble polymer and dilute nitric acid are added to the hydroxide dispersion for preventing aggregation of the mixed hydroxide and controlling the pH of the dispersion systems ($\text{pH} = 2-3$). Kanbara specifically recognized the difficulty in preparing an electrically conducting ITO thin film with an indium hydroxide-tin hydroxide aqueous sol/solution because of aggregation of metal hydroxide. In order to sidestep this problem, Kanbara teaches ramping up the viscosity so that the aggregation is reduced. Kanbara accomplishes this change in viscosity with the addition of water-soluble polymers, such as poly(vinyl alcohol) and (hydroxypropyl)cellulose. (Kanbara, at pgs. 643, RHS and 644, LHS).

Kanbara teaches a very different coating solution for forming films. Kanbara requires a high viscosity dispersion while the present invention does not. Therefore, it is clear that Kanbara, et al. fails to teach, disclose, or even suggest, a transparent aqueous solution containing stannic acid and a water-soluble polymer, that is not a dispersion, that can be

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suitably employed as a coating solution or in a coating method for forming a conductive tin oxide film. Thus, the rejection should be withdrawn.

The Examiner has rejected Claims 1-4, 6, 8-18, 21 and 22 under 35 U.S.C.102(e) as being anticipated by U.S. Patent 6,066,442 to Kurachi, et al. Applicants respectfully disagree.

Kurachi teaches an anti-static-treated film material having an electro-conductive layer. However, Kurachi does not teach electro-conductive particles as an aqueous solution as in the present invention. As pointed out by Examiner Shosho, Kurachi, et al. merely disclose that the anti-static layer is composed of the electro-conductive particles, an organic compound having T_g or melting point at not higher than 50° C, and a polymeric binder. (Col. 7, lines 55-59). Kurachi, et al. further discloses the method of dispersing the electro-conductive or semi-conductive particles in the mixture of the polymeric binder and the organic compound having T_g of fusing point not higher than 50° C. (col.11, lines 22-25). In addition, Kurachi, et al. disclose that the electro-conductive particles and semi-conductive fine particles are used after being dispersed or dissolved in a binder. (col. 10, lines 29-31). The cited reference does not, however, teach using the elector-conductive particles as an aqueous solution as in the present invention. The electro-conductive particles are only used as sol solution, such as SnO₂ sol solution in the examples. (See for example, Col. 23, line 27 through Col. 24, line 7).

Therefore, Kurachi, et al. fails to teach, disclose, or even suggest, that a specific transparent aqueous solution containing stannic acid and a water-soluble polymer can be suitably employed as a coating solution in a coating method.

Examiner Shosho rejects Claims 7 and 20 under 103(a) as being unpatentable over Kanbara, et al. or Kurachi, et al, either of which in view of U.S. Patent 4,113,507 to McHenry, et al. Applicants respectfully disagree.

According to the Examiner, the difference between Kanbara and Kurachi and the present invention is the requirement in the claims of amine. Since McHenry is drawn to tin oxide film and discloses the use of amine, the Examiner concludes that it would have been obvious to use amine in the either of the primary references and arrive at the present invention. Not only are Kanbara and Kurachi inappropriate primary references, as discussed above, but McHenry is not sufficient to bridge the deficiencies left by Kanbara or Kurachi.

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McHenry, et al. is insufficient because they merely disclose the use of amine such as triethylamine, trimethylamine and diethylamine as a solvating agent. The present invention, on the other hand, comprises an aqueous solution containing stannic acid, and a water-soluble polymer having a polar group. Furthermore, Claim 1 of the present invention requires that the polymer is dissolved in the aqueous solution in the presence of at least one compound selected from the group consisting of ammonia and a water-soluble amine. Therefore, the rejection should be withdrawn.

The Examiner rejects Claims 8, 12 and 21 under 35 U.S.C. 103(a) as being unpatentable over Kanbara, et al. in view of U.S. Patent 4,431,764 to Yoshizumi. According to the Examiner, the difference between Kanbara, et al and the present invention is the requirement of dopant. As discussed above, Kanbara fails as a primary reference and Yoshizumi simply cannot be used to correct the deficiencies. Therefore, the rejection should be withdrawn.

The Examiner rejects Claims 9, 13 and 22 under 35 U.S.C. 103(a) as being unpatentable over Kanbara, et al. in view of U.S. Patent 5,705,265 to Clough, et al. Since Kanbara fails as a primary reference and because Clough cannot cure the deficiencies, the rejection should be withdrawn.

The Examiner cites U.S. Patent 4,389,451 to Fujioka, et al. and U.S. Patent 5,204,177 to Sato, et al. as relevant prior art. Applicants have reviewed the references and concur that they do not affect the patentability of the present invention.

The coating solution for forming transparent conductive tin oxide film according to the present invention is novel, non-obvious and distinguishable from the cited references because the present invention contains stannic acid and a water-soluble polymer having a polar group and is completely different from the dispersions or solutions disclosed by the cited references.

Since the coating solution for forming transparent conductive tin oxide film, according to the present invention, contains stannic acid and a water-soluble polymer having a polar group, the formed transparent conductive film adheres to a substrate in a favorable state, due to the polar group and is endowed with high density. In addition, the coating solution contains no organotin compound other than stannic acid and is applicable to a

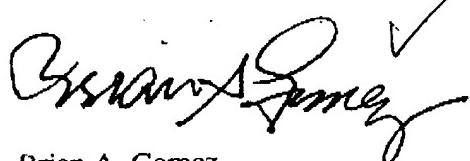
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substrate or other objects in the form of transparent solution, to thereby form transparent conductive tin oxide film containing no defects such as pinholes, micro-cracks, or voids.

The stability of the coating solution according to the present invention is explained by the repulsion of resulting anion prepared by the deprotonation. Furthermore, the properties of the resulting transparent film are completely different from those of films prepared by dispersion.

In light of the above amendments and remarks, Claims 1-24 are considered to represent a novel and unobvious advance in the art. Prompt issuance of a Notice of Allowance for these claims is requested. If any issues remain outstanding, the Examiner is urged to contact the undersigned attorney to expedite their resolution.

Respectfully submitted,



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